WHAT IS CLAIMED IS:

1. A process of spatially encoding a planar assembly of particles formed on a substrate by sequential injection of a multiplicity of groups of particles of at least one type, said process comprising:

providing a substrate comprising a light-sensitive planar electrode, the light-sensitive electrode being aligned with another planar electrode in substantially parallel arrangement, with said electrodes being separated by a gap, and the gap containing an electrolyte solution which is in contact with said electrodes;

placing a group of at least one type of particles selected from a reservoir containing said at least one type of particles into the electrolyte solution so as to confine said injected particles into a first segment of the light-sensitive electrode delineated by a first illumination pattern on said light-sensitive electrode;

translocating said confined particles to a second segment of the light-sensitive electrode delineated by a second illumination pattern on said light-sensitive electrode; and

merging said particles with any pre-existing planar assembly of particles previously formed in said second segment of the light-sensitive electrode.

2. The process of claim 1, further comprising recording an image showing said translocated particles of said groups of particles in their final positions within said second segment.

3. The process of claim 2, wherein the first illumination pattern and the second illumination pattern are provided by using a programmable illumination pattern generator, said method further comprising reiterating the placing, translocating, merging and recording steps n times, wherein n is an integer from zero to about 10,000.

4. A process of decoding a planar assembly of particles encoded according to the process of claim 3, said decoding process comprising:

cross-correlating an image of the planar assembly with each of the images recorded at the

completion of each placing, translocating and merging step.

5. A self-tuning filter comprising:

a light-sensitive planar electrode that is aligned with another planar electrode in substantially parallel arrangement, with said electrodes being separated by a gap, and the gap containing an electrolyte solution which is in contact with said electrodes and which contains colloidal particles, wherein said particles are assembled in a planar array on the light-sensitive electrode, said array being composed so as to partially block incident light that controls array assembly in response to an electric field, and wherein the lateral density of said array self-adjusts in response to transmitted light intensity;

means for adjusting frequency of said applied electric field to a value lower than the characteristic dielectric relaxation frequency of said particles;

means for defining an illuminated area on said light-sensitive electrode; and

means for adjusting illumination intensity so as to induce assembly of said particles within the illuminated area.

6. The self-tuning filter of claim 5, wherein self-adjustment determines an optimal lateral density on attaining equilibrium which correlates with the transmitted light intensity of the frequency of the applied electric field.

7. A fractionation device for spatially separating and sorting a mixture of particles on a substrate comprising:

a substrate comprising a light-sensitive planar electrode, the light-sensitive electrode being aligned with another planar electrode in substantially parallel arrangement, with said electrodes being separated by a gap, and the gap containing an electrolyte solution which is in contact with said electrodes and which contains colloidal particles suspended in the electrolyte solution, said particles comprising a multiplicity of particle types exhibiting a differential frequency-dependent response to an applied electric field in accord with the respective characteristic frequency of each said particle type;

means for applying a time-varying voltage between said electrodes so as to generate a time-varying electric field and to induce the motion of said particles;

a means for adjusting frequency to a value less than the characteristic frequency of at least one particle type; and

a light-control component permitting illumination of a predetermined segment of the substrate with a predetermined intensity so as to induce collection into said illuminated segment of substantially all said particles of said at least one particle type having respective characteristic frequencies exceeding the frequency of the applied field.

8. The fractionation device of claim 7, wherein the particles are cells.

9. The fractionation device of claim 7, wherein the light-control component is a programmable illumination pattern generator.

10. The fractionation device of claim 7, wherein the particles may be collected into an illuminated segment being laterally scanned or reconfigured.

11. The fractionation device of claim 7, wherein the particles are separated based on differential-frequency response determined by particle size or by particle chemical composition.

12. A flow control device for generating fluid flow comprising:

a light-sensitive planar electrode that is aligned with another planar electrode in substantially parallel arrangement, with said electrodes being separated by a gap, and the gap containing a fluid medium that is in contact with said electrodes;

means for applying a time-varying voltage between said electrodes so as to generate a time-varying electric field and to induce said fluid medium to undergo lateral flow;

means for adjusting voltage magnitude and frequency to preselected values to control flow velocity; and

a light-control component permitting illumination of a designated segment of the light-sensitive electrode, the combination of said time-varying electric field and illumination producing transverse fluid flow in accordance with the contour shape of the illuminated segment, said flow having a velocity component everywhere directed parallel to the surface and normal to the contour.

13. The flow control device of claim 12, said device being operated to generate a sequence of flow configurations.

14. The flow control device of claim 12, said device being operated so as to produce local flow fields in a configuration effecting the mixing of the fluid medium.